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OBSERVATIONS ON THE IMPACT OF DWARF MISTLETOE ON DOUGLAS-FIR IN WESTERN MONTANA

by

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ABSTRACT

Dwarf mistletoe is known to reduce both height and diameter growth and thus reduce the yield of an infested stand. This comparison of two similar stands--one healthy and the other infested--gives an indication of the impact of this parasite. The healthy stand has produced 1.5 times the board foot volume in one-half the time. By predicting the volume of the healthy stand at age 120 (the age of the infested stand), the healthy stand will produce 3.7 times the board foot volume of the infested stand.

INTRODUCTION

Two similar stands, predominantly Douglas-fir, one healthy and the other infested by dwarf mistletoe, gave us an opportunity to measure the impact of dwarf mistletoe on the forest resource. We made projections of stand volumes to age 120 with intermediate cuts.

METHODS

Sampling.--Stand examination plots were taken in both stands and compiled by ADP to obtain the parameters. Fifteen plots were taken in the healthy stand and 17 plots were taken in the infested stand.

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Of the Douglas-fir trees tallied in the infested stand 77 percent were infected with dwarf mistletoe; 50 percent of the trees were heavily infected.

Only one lightly infected Douglas-fir was encountered in the healthy stand.

Location of study.--Yellow Bay logging unit, Flathead Indian Reservation, Lake County, Montana.

Other stand data.--Other data on the stands are listed in Table 1.

Table 1.--Data on healthy and infested stands in the study.

	Healthy	Infested
Legal description	Sec. 15, T. 24 N., R. 19 W.	Sec. 3, T. 24 N., R. 19 W.
Land class	Commercial forest	
Management	General forest	
Soil	Depth more than 18 inches, rocky	
Habitat type	Douglas-fir/Ninebark	
Physiographic site	Moist slope	
Elevation	3,800	3,400
Slope	40%	20%
Aspect	West	
Site index	70	
Average age	65	120
Crop trees per acre:		
Douglas-fir	140	221
Western larch	2	20
Other	65	86
TOTALS	207	327

Comparison of the stands.--Parameters of the two stands are given in Table 2.

Table 2.--Comparison of healthy and infested stands in the study.

Parameter	Healthy stand	Infested stand
Crop trees per acre	207	327
Douglas-fir	140	221
Western larch	2	20
Other	65	86
Excess trees per acre	592	753
Douglas-fir	490	612
Western larch	0	11
Other	102	130
Total trees per acre	799	1,080
Basal area per acre	247	146
Crop trees	127	19
Excess trees	120	127
Volume per acre (cu. ft.)	5,669	3,600
Crop trees	3,276	474
Excess trees	2,393	3,126
Volume per acre (bd. ft.)	22,398	15,339
Crop trees	13,788	1,972
Excess trees	8,610	13,367
Stocking percentage	-	-
Crop trees	125	84
Excess trees	194	178
Average diameter	-	-
Crop trees	10.6	3.3
Excess trees	6.1	5.6

Table 2.--Comparison of healthy and infested stands in the study (con.)

Parameter	Healthy stand	Infested stand
Ten-year diameter growth	--	--
Crop trees	1.39	0.75
Excess trees	1.06	.52
Periodic annual increment (cu. ft.)	193.00	65.00
Crop trees	109.00	11.00
Excess trees	84.00	54.00
Periodic annual increment (bd. ft.)	951.00	308.00
Crop trees	588.00	53.00
Excess trees	363.00	255.00

The healthy stand has produced 1.6 times the cubic foot volume and 1.5 times the board foot volume in one-half the time. These figures are based on harvesting both stands now.

Growth differences were projected under uneven-aged management to age 120 (the age of the infested stand). By computing the annual cut for the healthy stand over the next 55 years, using the Austrian formula (Meyer et al., 1952), the projected growth for the stand will be:

Where: Periodic annual increment = 588 bd. ft. per acre (from table 2)

Growing stock level = 5,500 bd. ft. per acre (as established in Flathead Management Plan)

Reserve growing stock level at present = 13,788 bd. ft. per acre (from table 2)

Then: $$\text{The annual cut} = \text{PAI} + \left[\frac{\text{Present reserve vol. - growing stock level}}{\text{Years to attain growing stock level}}\right]$$

$$\text{Annual cut} = 588 + \left[\frac{13{,}788 - 5{,}500}{55}\right]$$

Annual cut = 739 bd. ft. per year.

Using 20-year cutting cycles the total board-foot volume production on the healthy stand would be:

1. Present cut	-	8,610 bd. ft. per acre
2. Annual cut for next 55 years (739 bd. ft. per acre x 55)	-	40,645 bd. ft. per acre
3. Reserve growing stock level	-	5,500 bd. ft. per acre
Total volume production after 120 years	-	54,755 bd. ft. per acre

Growth differences were also projected under even-aged management to age 120 (the age of the infested stand), assuming an immediate thinning, two additional thinnings at age 85 and 105, and a clearcut at age 120. Table 3 gives the optimum number of crop trees per acre at projected stand age (based on FSH 2471.15 Region 1, Management of western larch--Northern Region).

Table 3.--Optimum number of crop trees per acre at different ages

Age	Average d.b.h.	Average height	Number of trees	Volume per tree (bd. ft.)
65	10.0	88	151	60
85	13.8	105	108	167
105	16.4	116	81	275
120	18.2	123	-	375

Projected yield of healthy stand will be:

Removal of excess crop trees, now	8,610 bd. ft.
Thinning now, age 65, remove 56 trees per acre @ 60 bd. ft.	3,360 bd. ft.
Thinning, age 85, remove 43 trees per acre @ 167 bd. ft.	7,181 bd. ft.
Thinning, age 105, remove 27 trees per acre @ 275 bd. ft.	7,425 bd. ft.
Harvest clearcut, age 120, remove 81 trees per acre @ 375 bd. ft.	30,375 bd. ft.
Total yield of healthy stand	56,951 bd. ft.

Differences in volume production under the two systems of management are not significant.

Reduction in yield due to dwarf mistletoe in this area is in line with a previous study in western larch (On and Dooling, 1969).

REFERENCES

Meyer, A., A. Recknagel, D. D. Stevenson, and R. A. Bartoo, 1952. Forest Management. 2nd Ed. Ronald Press, New York.

On, D., and O. Dooling, 1969. A study of dwarf mistletoe infection on the growth of western larch. Division of Timber Management, Northern Region (unpub.).